Arkansas's Role in Energy Transmission Management

The National Science Academies -
Building the Arkansas Innovation Economy
March 8, 2010

Nick Brown, President & CEO, SPP

SPP Southwest Power Pool

Helping our members work together
to keep the lights on...
today & in the future

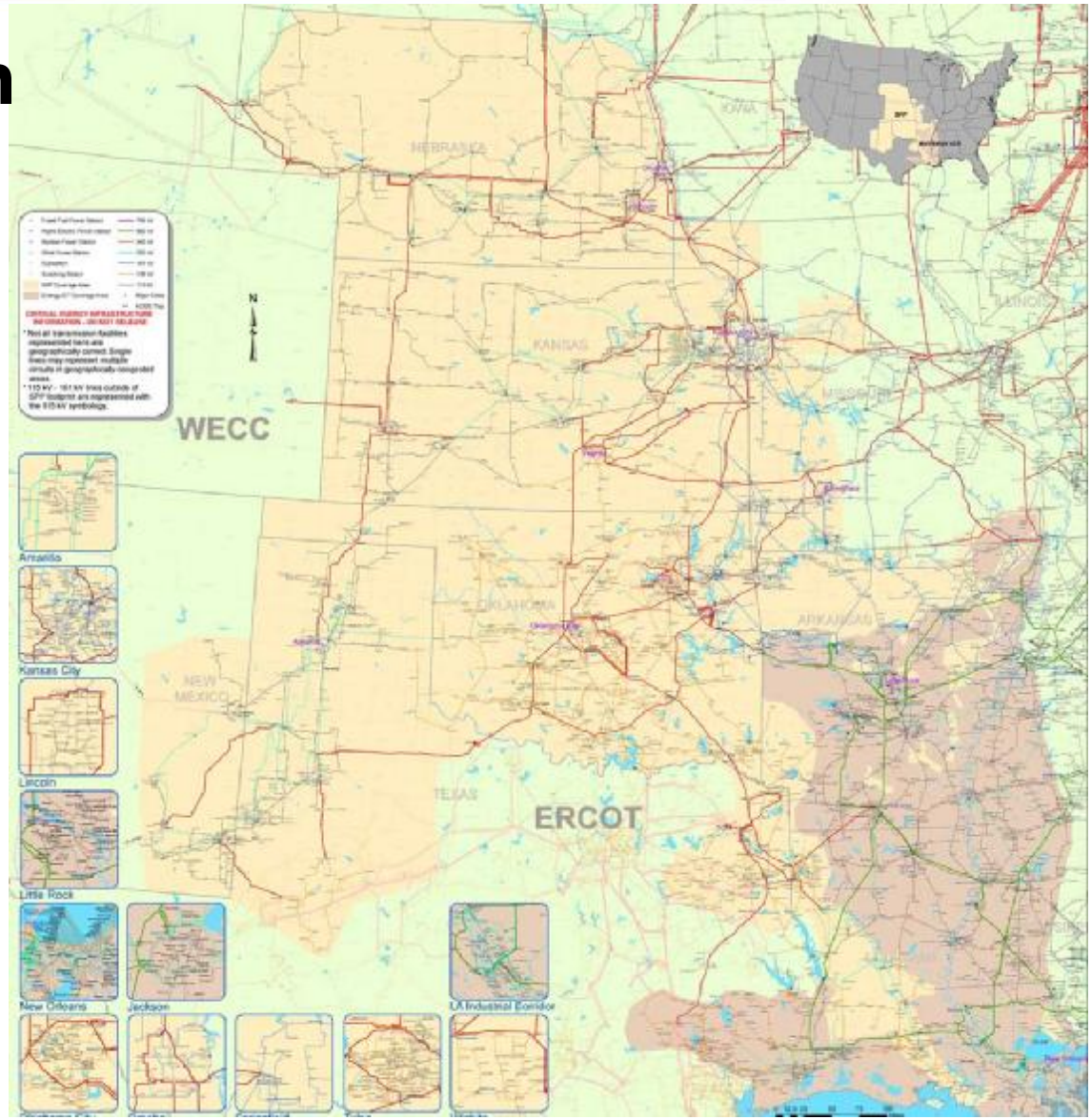
Our Beginning

- **Founded 1941 with 11 members**
  - Ø **Utilities pooled resources to keep Arkansas aluminum plant powered for critical defense**
- **Maintained after WWII for reliability and coordination**

Operating Region

- **370,000 square miles service territory**
- **50,575 miles transmission lines:**

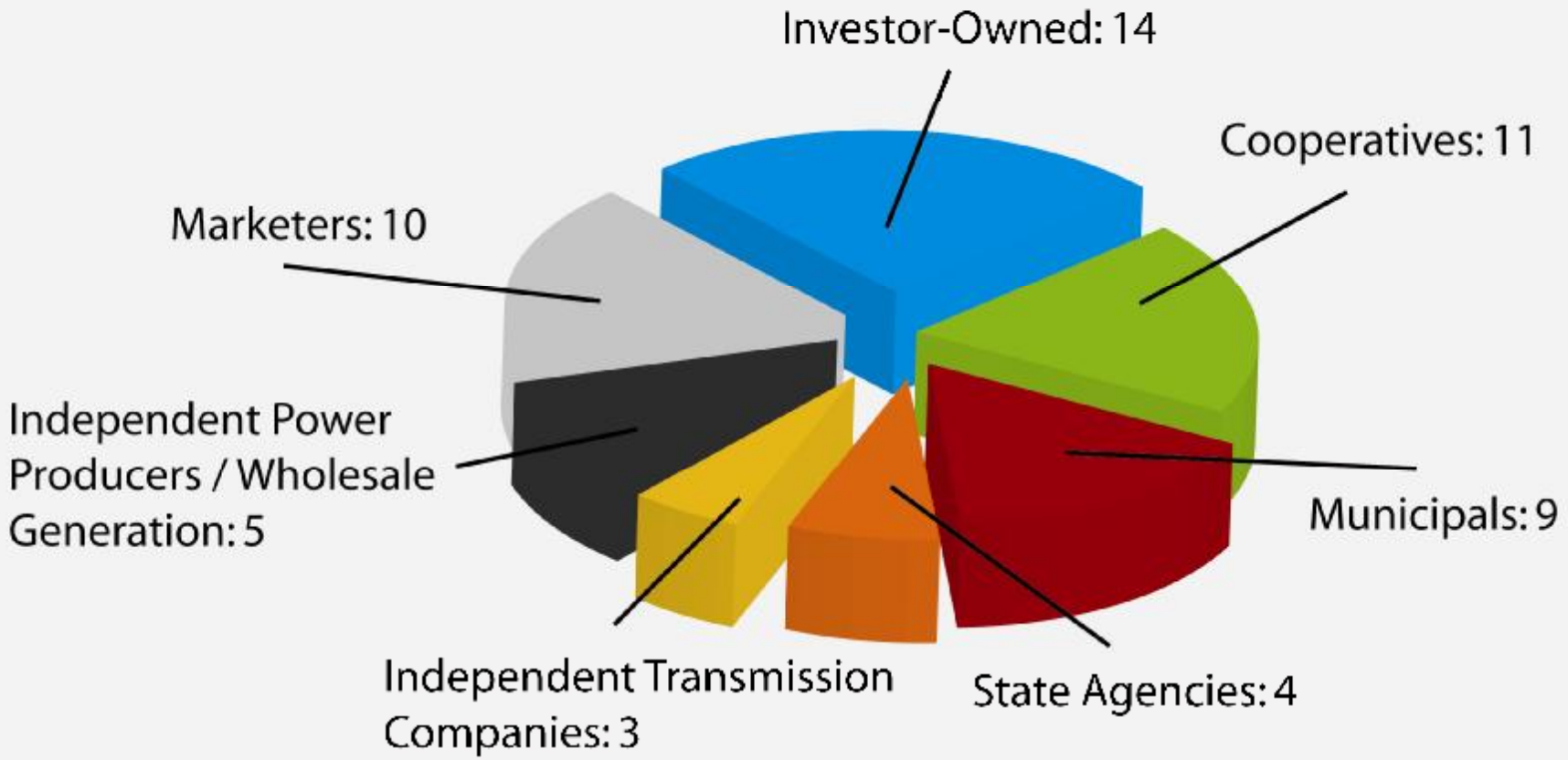
69 kV –	16,182 miles
115 kV –	10,041 miles
138 kV –	9,284 miles
161 kV –	4,469 miles
230 kV –	3,831 miles
345 kV –	6,662 miles
500 kV –	106 miles



Members in nine states:

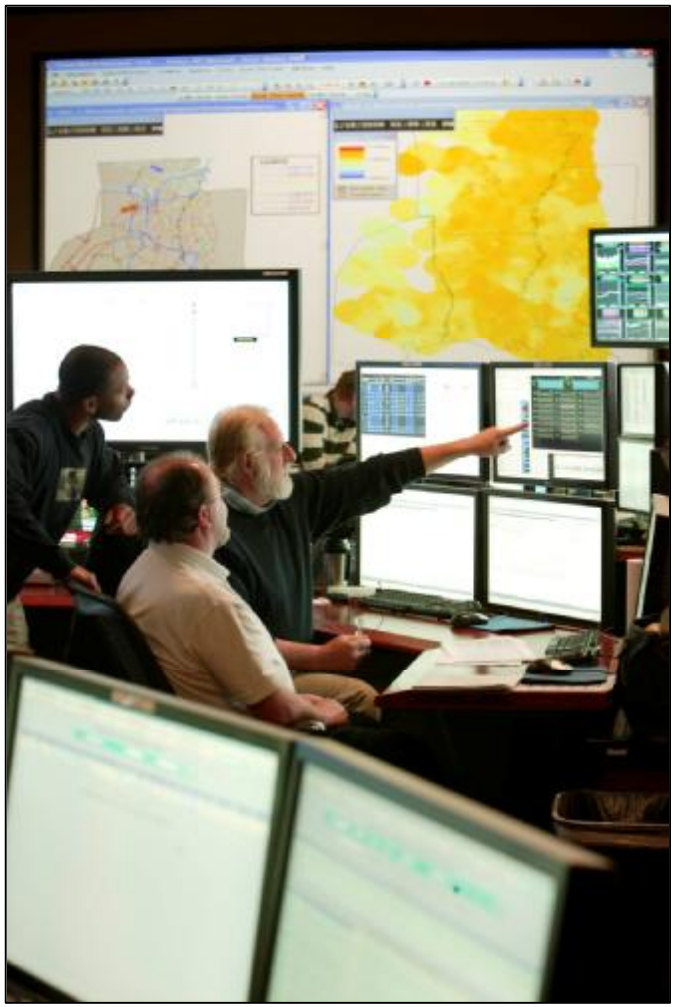
Arkansas	Mississippi	New Mexico
Kansas	Missouri	Oklahoma
Louisiana	Nebraska	Texas

56 SPP Members



SPP at a Glance

- Little Rock based
- 439+ employees
- $120M operating
  $70M capital
- 24 x 7 operation
- Full redundancy and backup site



Reliability Coordination

- **Monitor interconnected network**
- **Anticipate problems**
- **Take preemptive action**
- **Coordinate regional response**
- **Independent administration**

As "Air Traffic Controllers," our operators comply with…

…over 1,300 pages of reliability standards and criteria.

Transmission Service

- **Provide one-stop shopping**
- **Consistent rates, terms, & conditions**
- **Regional focus**
- **Independent administration**
- **Process > 15,000 transactions/month**

As "Sales Agents," we administer …

…an 872 page transmission rate tariff on behalf of our members and customers.

Market Operation

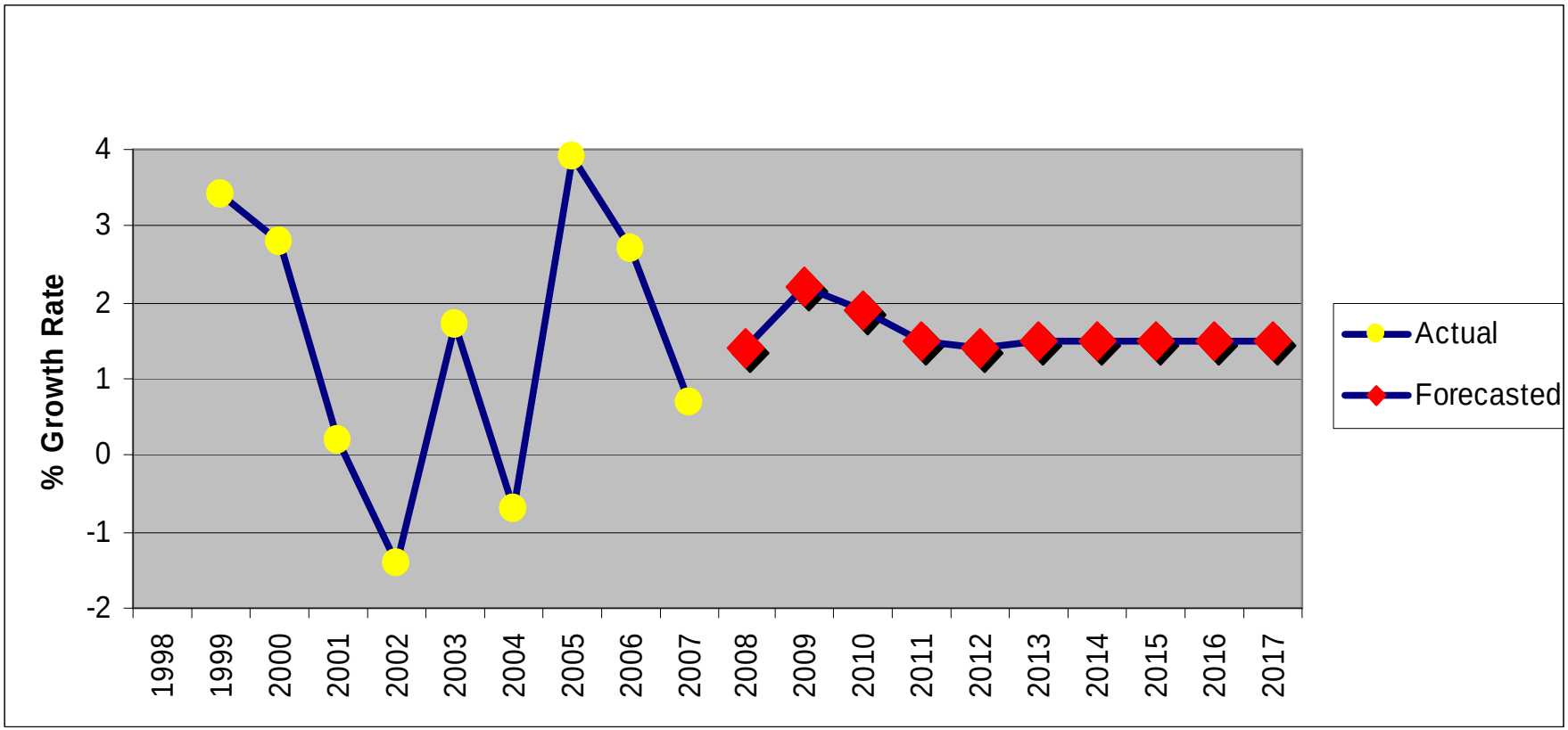
- **Monitor resource / load balance**
- **Ensure the most economic dispatch, provided system reliability is met**
- **Provide settlement data for market services**

SPP's Energy Market is like the "NYSE"..

…and follows over 200 pages of market protocols.

The Regional Outlook Assessment…

Actual & Forecast Peak Demand



Quick Statistics

- 66,175 megawatts capacity resources
- 847 plants – 6,079 substations

Fuel Type	Percentage Capacity
Coal	40%
Gas/Oil	42%
Nuclear	3%
Hydro	4%
Wind	4%
Other	7%

Needed New Generation by 2017 (MW)

Planned	Proposed	12% CM	Total
5,849	2,758	1,452	10,059

With an average size baseload unit of 500 MW,

we need more than 20 new units within 10 years!!

Perfect Storm of Complex Issues

Growth in demand

Greenhouse gas emissions

Political and technical challenges

Aging infrastructure

Challenges with integrating renewables into grid

Trade imbalance

Lack of transmission

Lengthy permitting for new generation

Rising gas prices

Growth in uncommitted capacity

There is no...

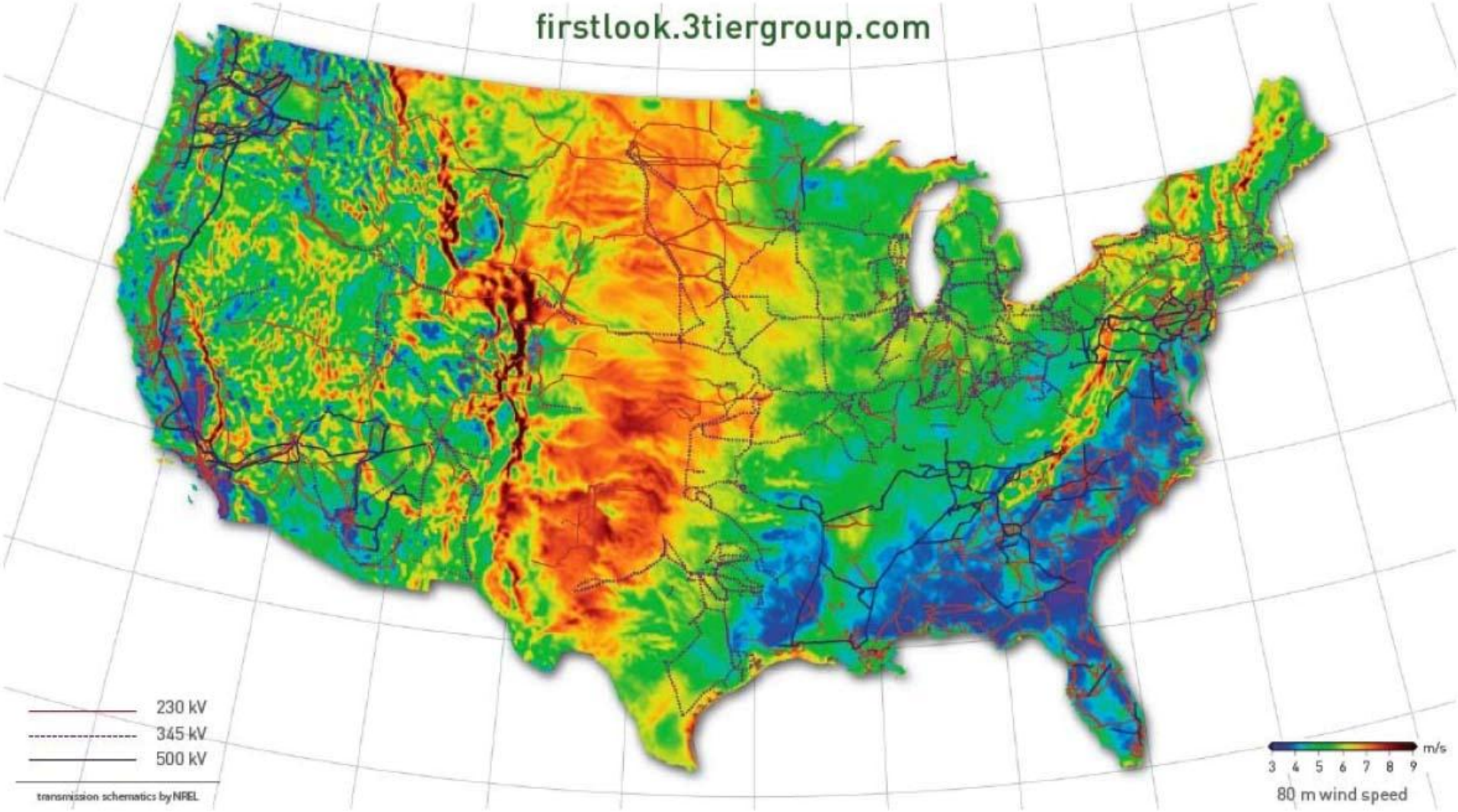
The solution will take…

Immediate National Leadership Mandating:

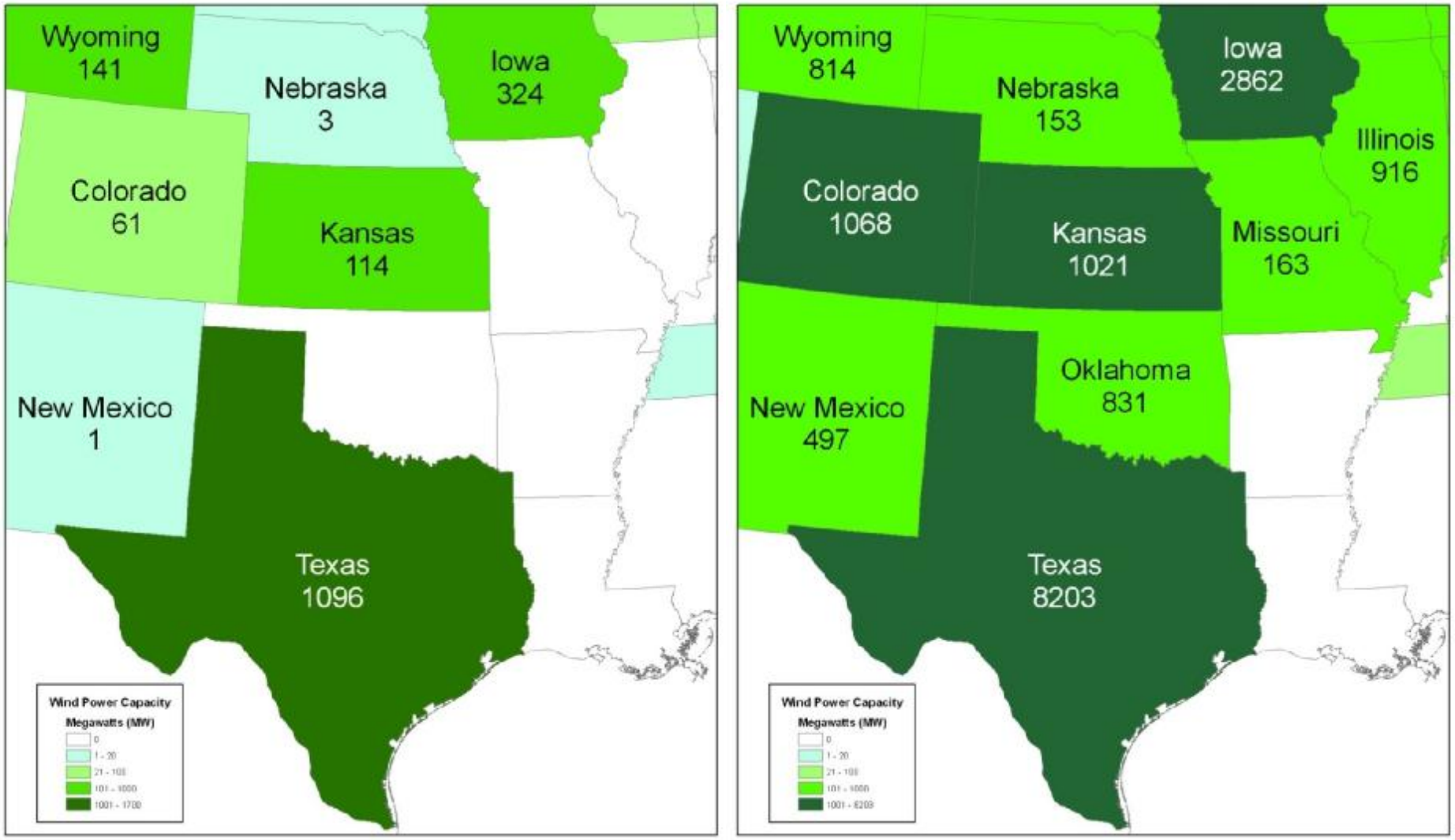
- A broad portfolio approach to electric generation resources to meet demand & reduce emissions
- Expansion of bulk electric transmission to deliver remote renewables & baseload generation alternatives
- Significant research, development and demonstration of carbon capture & storage, renewables, and efficiency and demand response technologies

An Important Role for Renewables…

Annual Average 80m wind speed

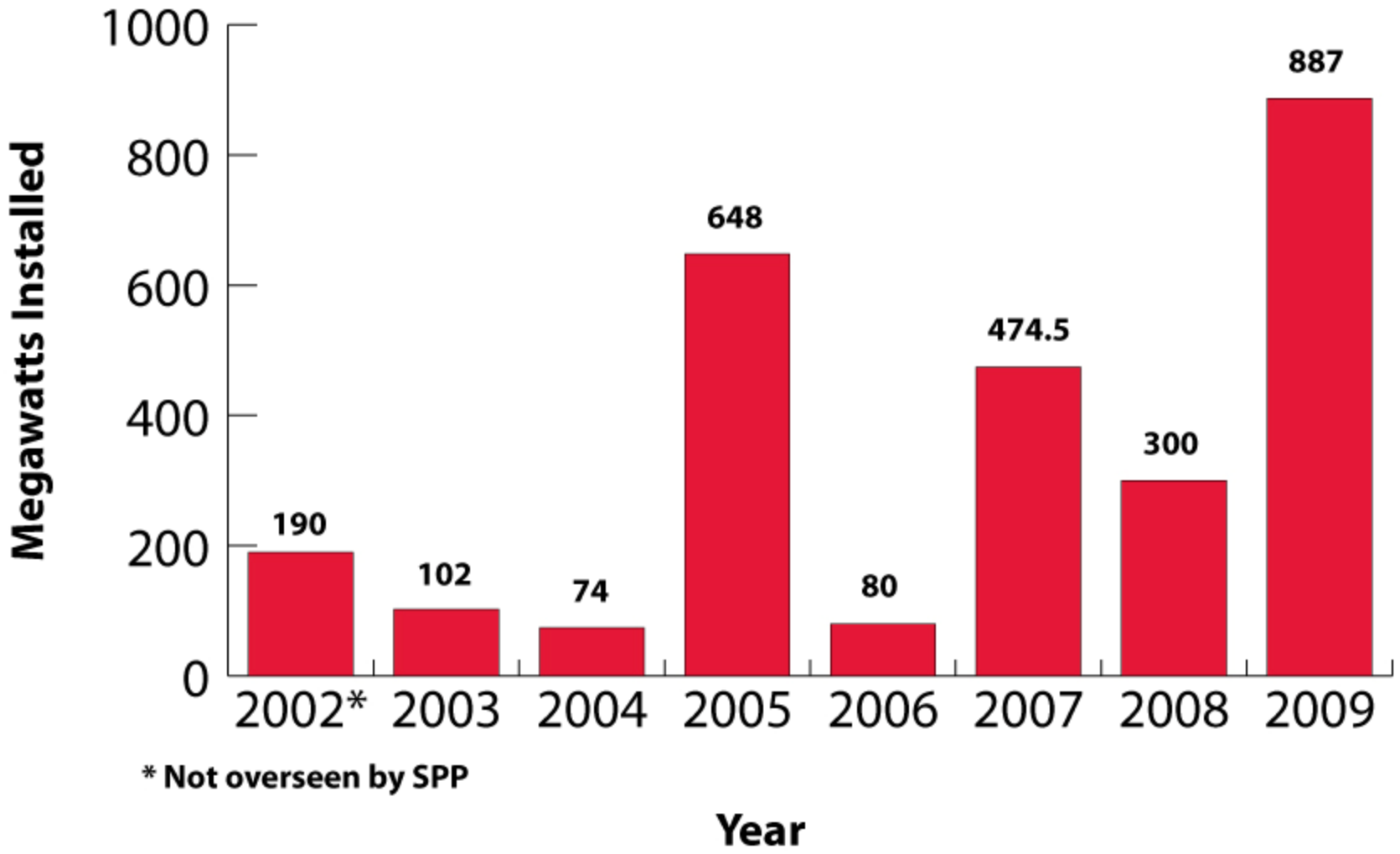


Wind In Service: 2001 2009



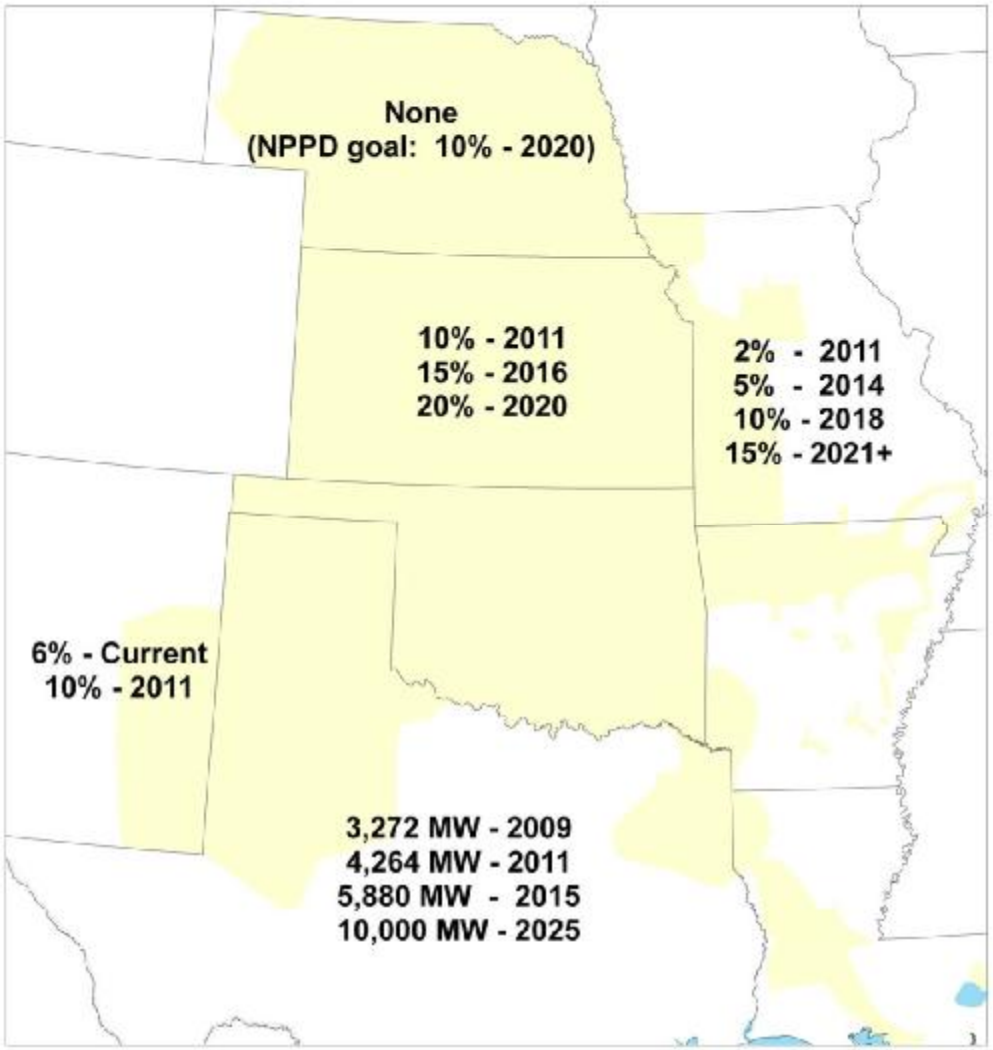
Source: NREL

Wind Installed by Year (2002-2009)



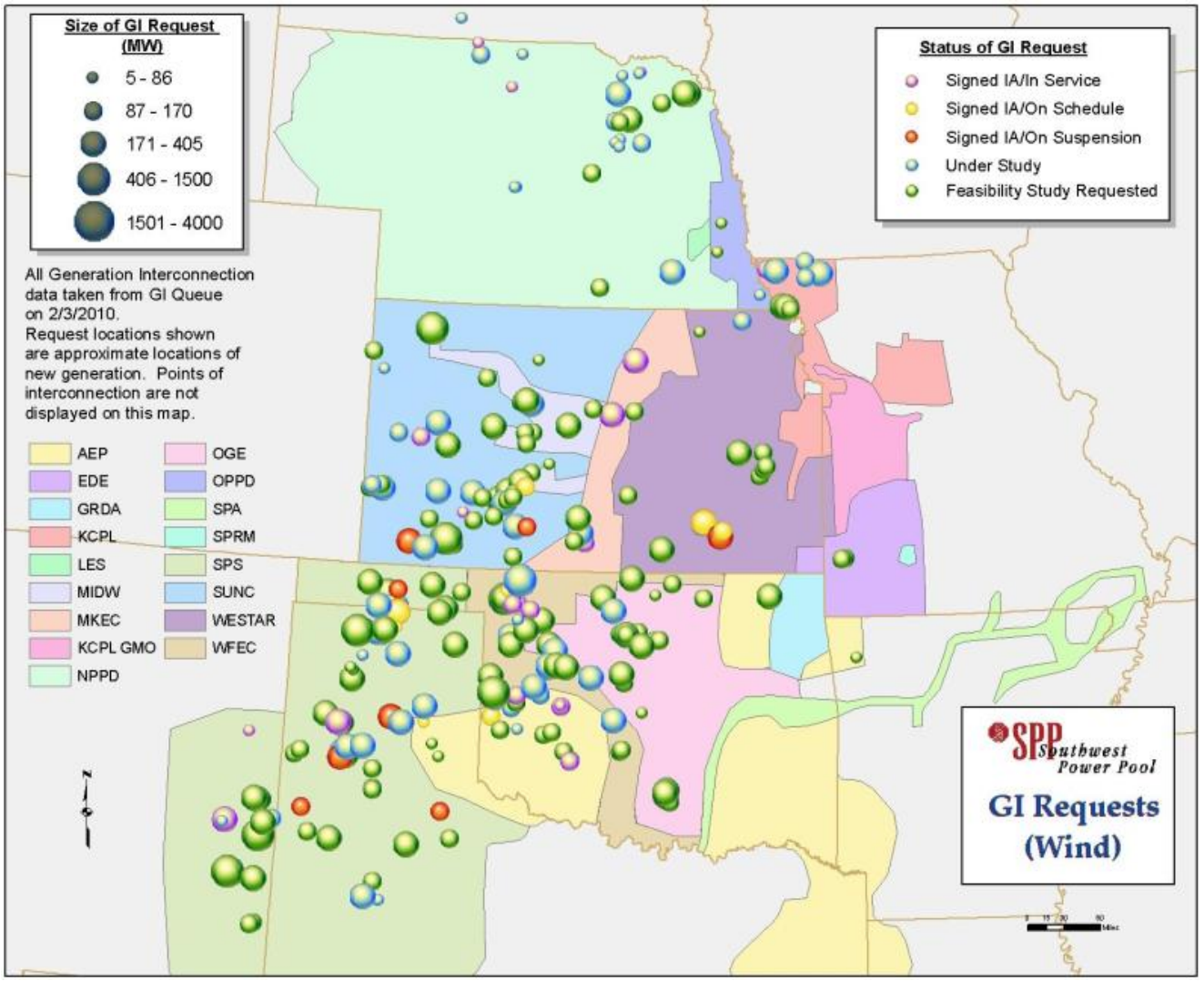
Source: SPP

Renewable Energy Standards By State

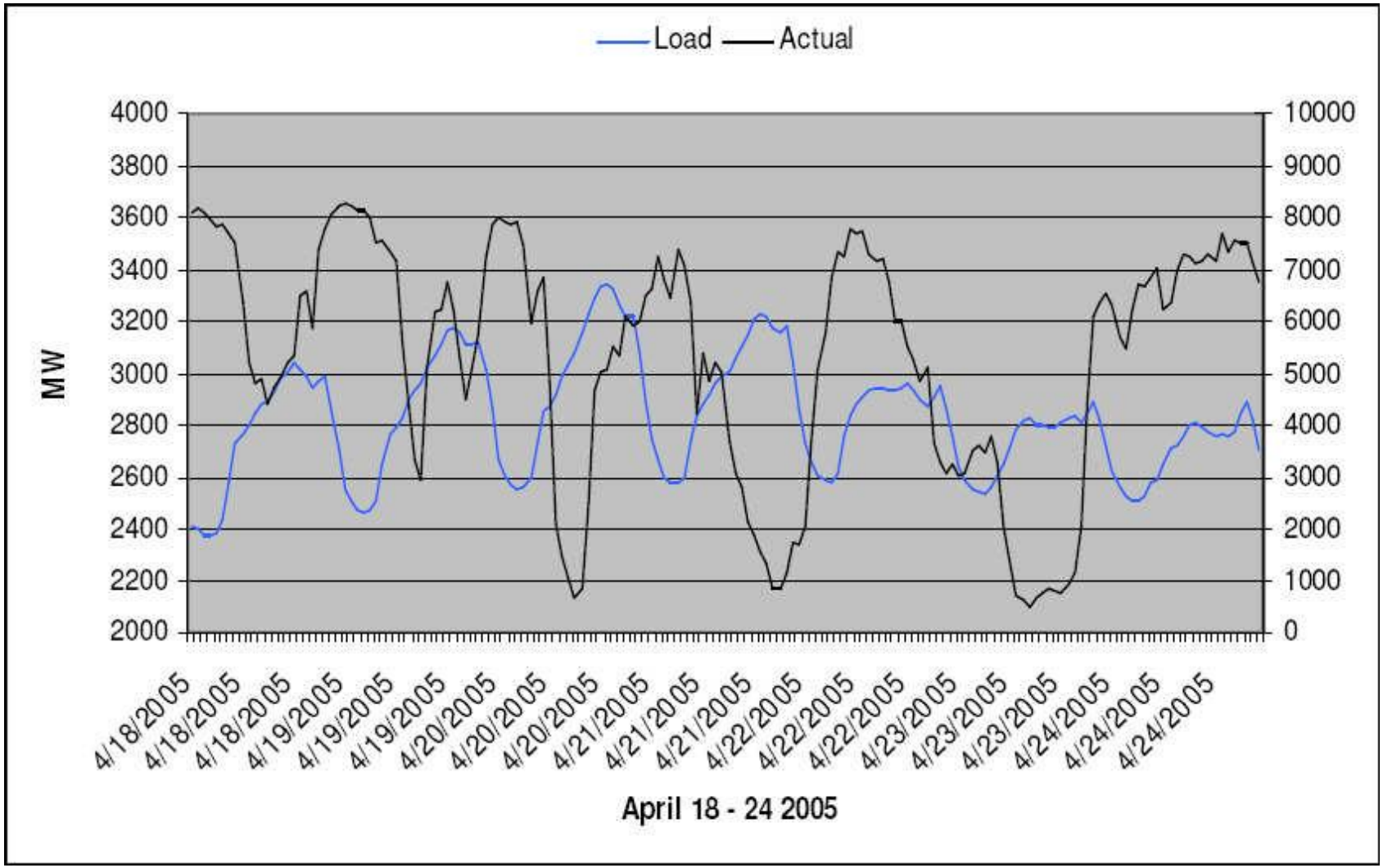


Source: SPP

Generation Interconnection Requests



Correlation Between Wind and Load



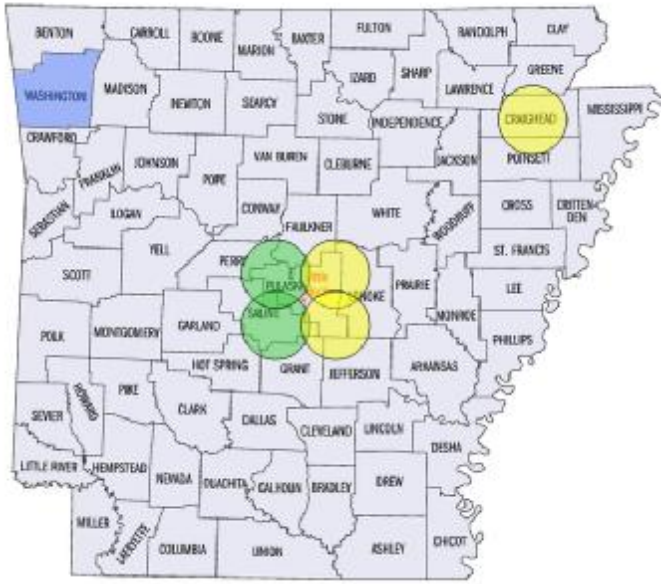
Oklahoma, Wind, and Economic Development

- Economic benefit of 1,000 MW = $1.25 billion
  - Ø 5,530 construction jobs, 215 permanent jobs
- Average wages in component manufacturing industry = $40,709 - 15% higher than average state wage
- Strong correlation between Western OK counties that have lost population in recent decades with counties that have significant wind resources
- In many cases, land suited for wind development has lower per-acre returns for agricultural use
- Sooner Survey of 600 registered voters:
  - Ø 72% of Oklahomans willing to pay more for wind-generated electricity
  - Ø 91% approve of further development of wind farms

Source: NREL; Cole, Hargrave Snodgrass, and Associates; Oklahoma Department of Commerce

Arkansas Becoming Manufacturing Hub

- **LM Glasfiber**
  - Ø Employs 300 workers @ $12-$15/hour
  - Ø Invested $95 million in Little Rock
- **Mitsubishi Power Systems**
  - Ø Announced October 2009
  - Ø $100 million plant will bring 400 jobs in 2011
- **Nordex**
  - Ø Sept 2009 - Broke ground on $100 million plant
  - Ø Expected to employ 700 by 2014
- **Emergya Wind Technologies/Polymarin**
  - Ø Plans to invest $16 M and create 830 jobs @ $15/hour

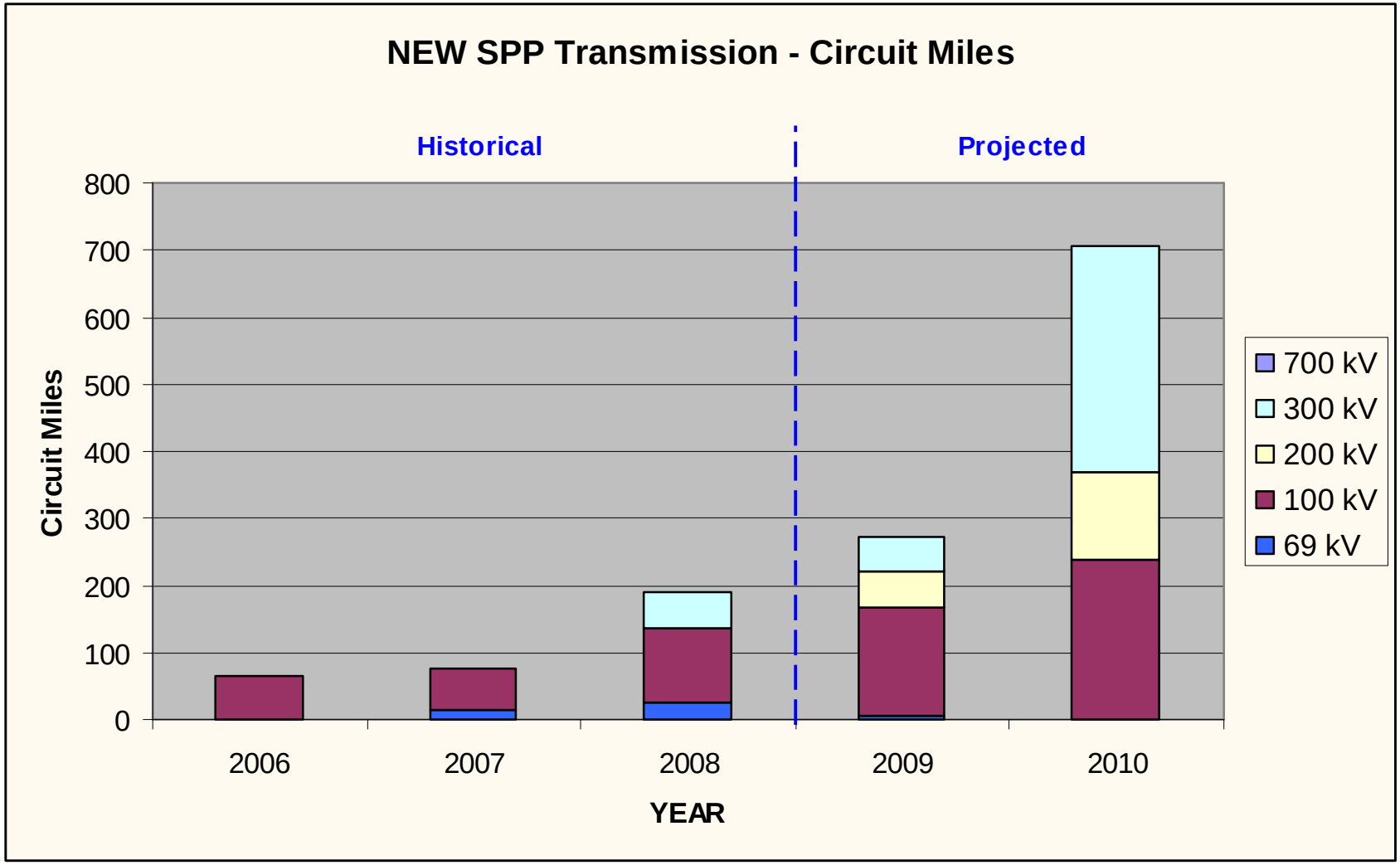


Installed Wind
Existing Manufacturing
Announced manufacturing

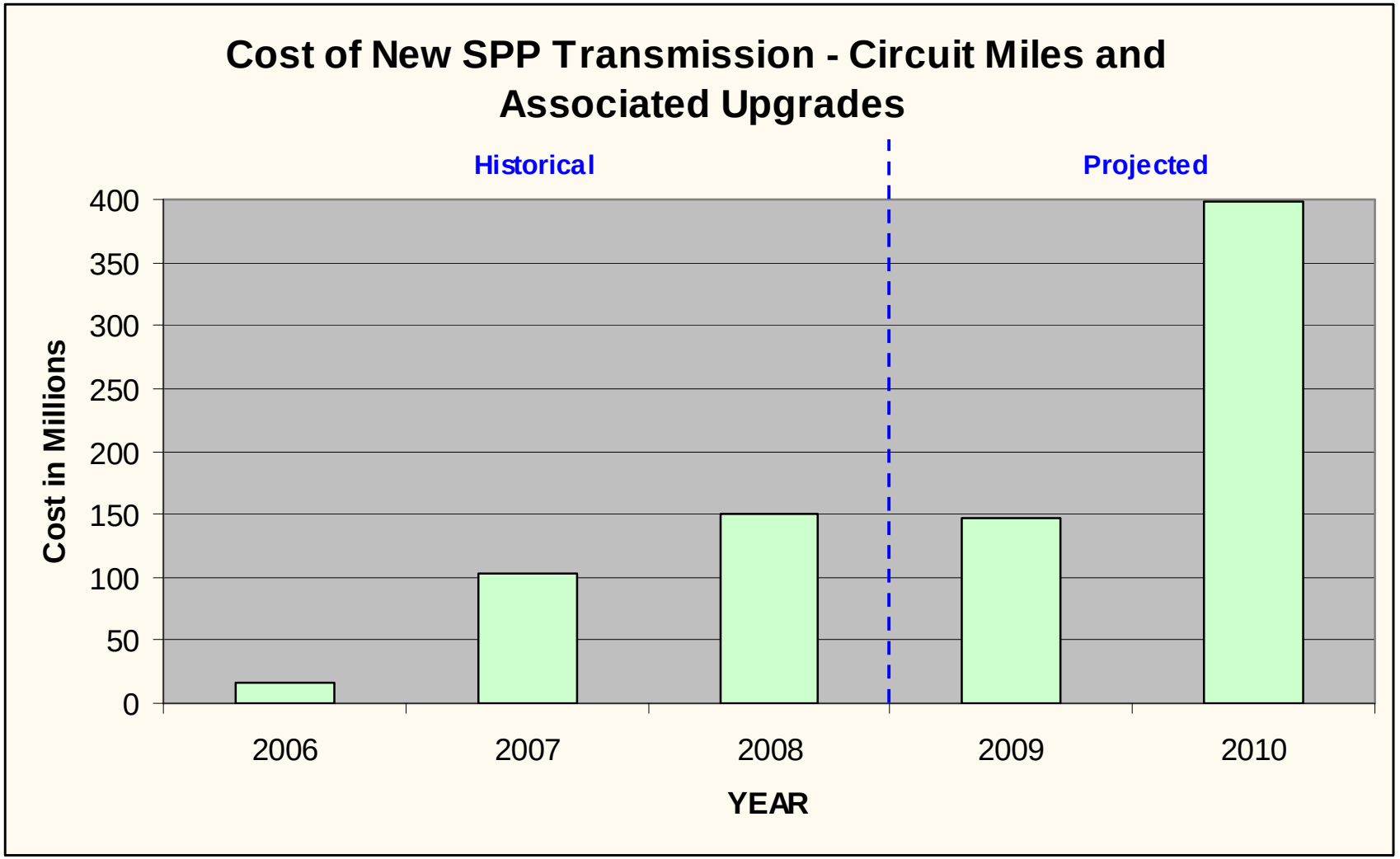
Sources: NREL, AR Economic Dev. Commission, Nordex, *Arkansas Business*

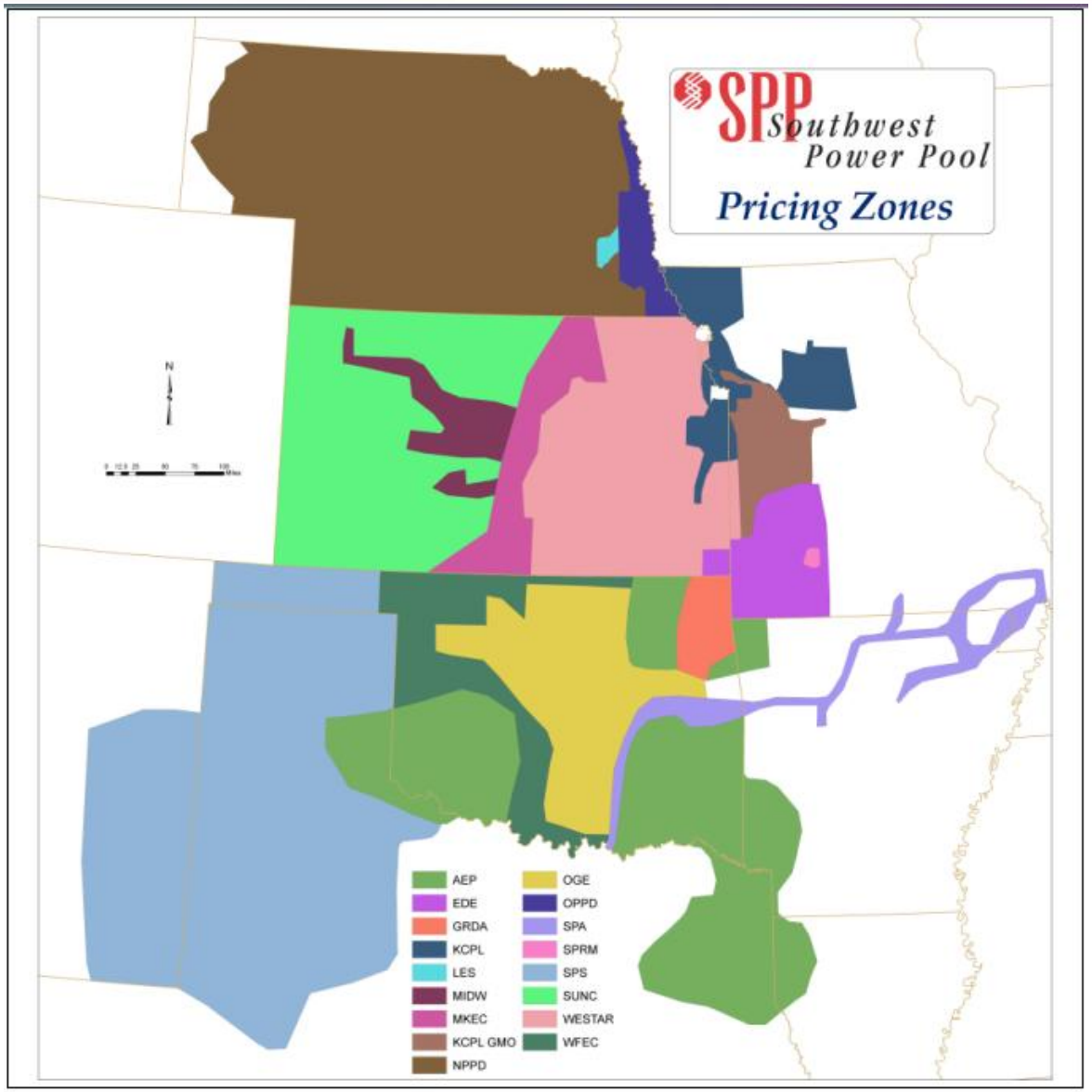
Transmission – 10%
Constraining 90%...

SPP is Building Transmission

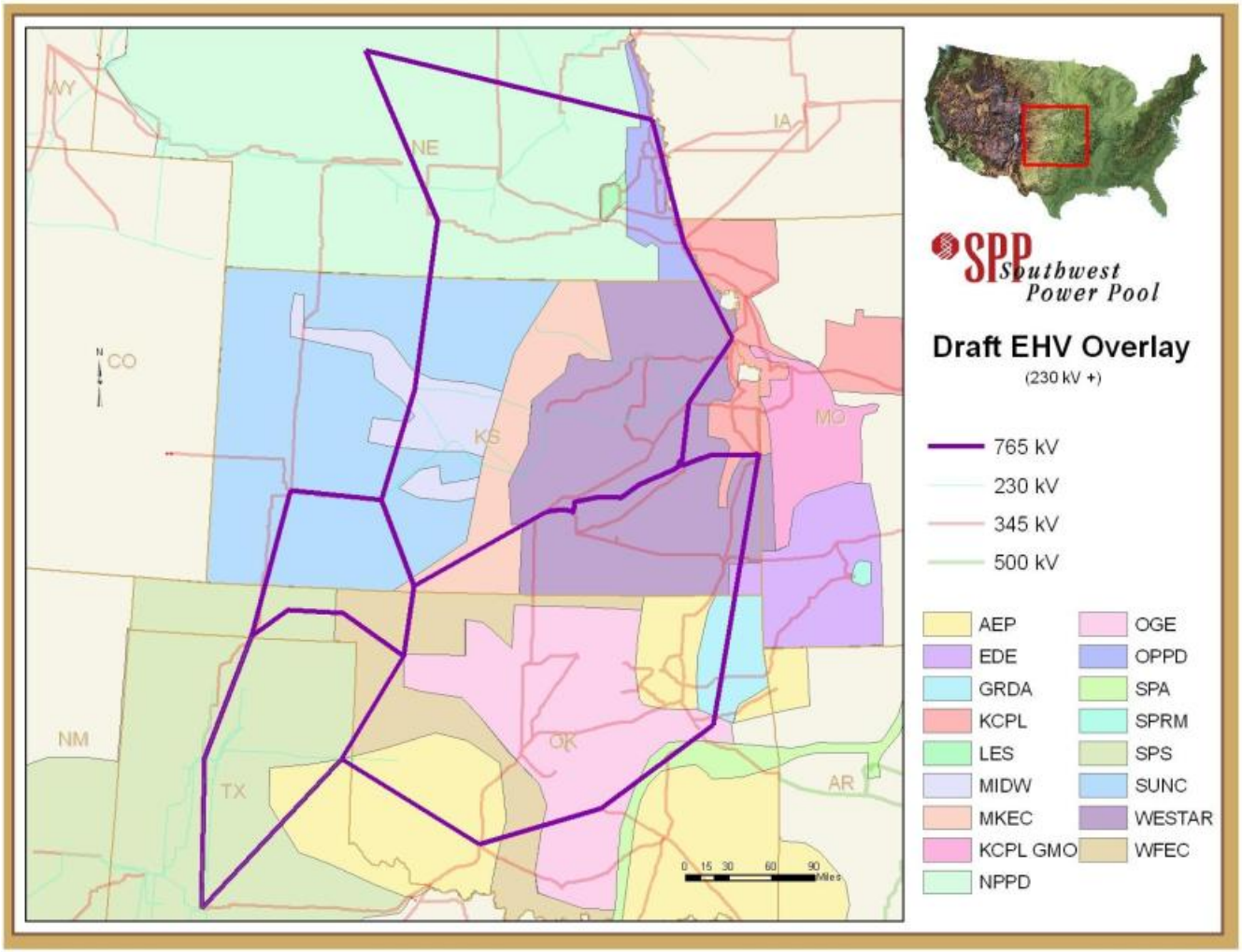


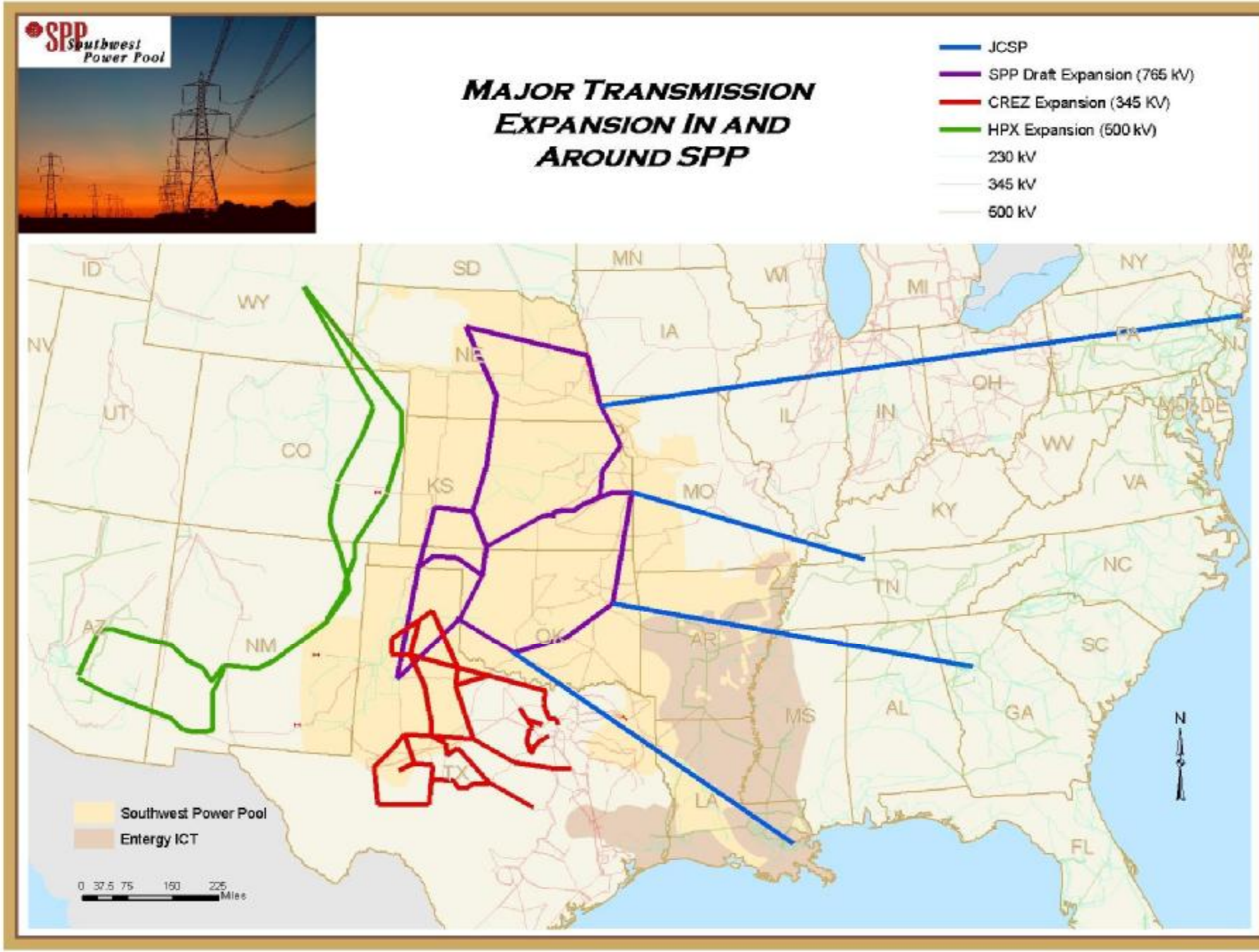
Transmission Expansion - Costs




SPP Southwest Power Pool
Pricing Zones
N
AEP
EDE
GRDA
KCPL
LES
MIDW
MKEC
KCPL GMO
NPPD
OGE
OPPD
SPA
SPRM
SPS
SUNC
WESTAR
WFEC

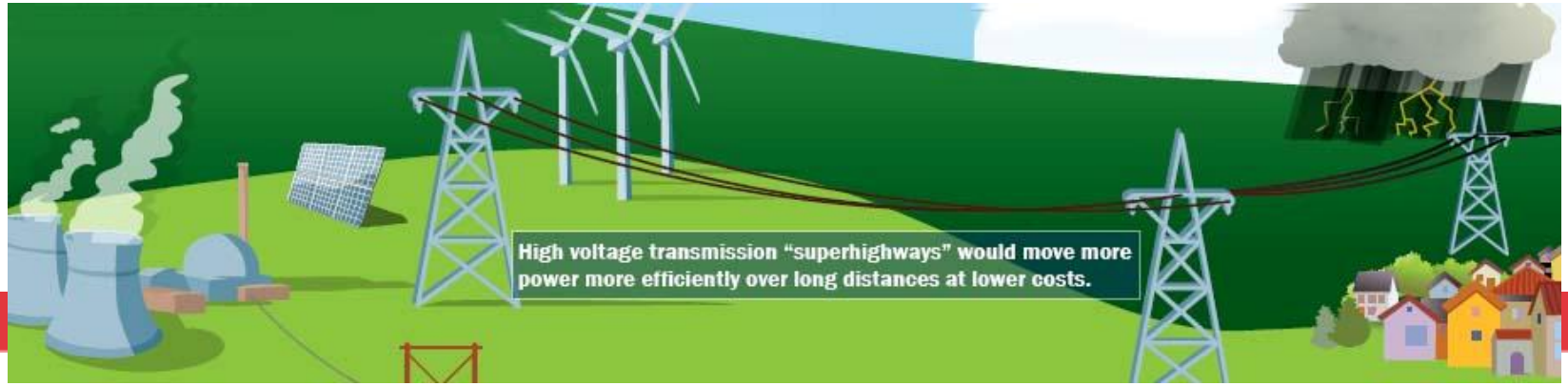
Draft EHV Overlay




SPP Southwest Power Pool
MAJOR TRANSMISSION EXPANSION IN AND AROUND SPP
JCSP
SPP Draft Expansion (765 kV)
CREZ Expansion (345 KV)
HPX Expansion (500 kV)
230 kV
345 kV
500 kV
ID
WY
NV
UT
CO
AZ
NM
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
OH
KY
TN
AL
WV
VA
NC
SC
GA
FL
NY
NJ
MD
DE
N
Southwest Power Pool
Entergy ICT
0 37.5 75 150 225
Miles

Examples of Transmission Benefits

- Fuel Diversity
- Market Liquidity Improvements
- Ability to Idle High Cost/Environmental Impact Resources
- Energy Capacity and Ancillary Market Facilitation
- Storm Hardening
- Increased Competition
- Extreme Reliability Event Mitigation (n-1) and (n-2) Weather & Wind
- Ability to Serve New Load
- Capacity Factor Improvement of Wind Resources
- Reserve Margin Reduction
- Export and Import Improvement
- Improved Operational Efficiencies



Quantitative Benefits

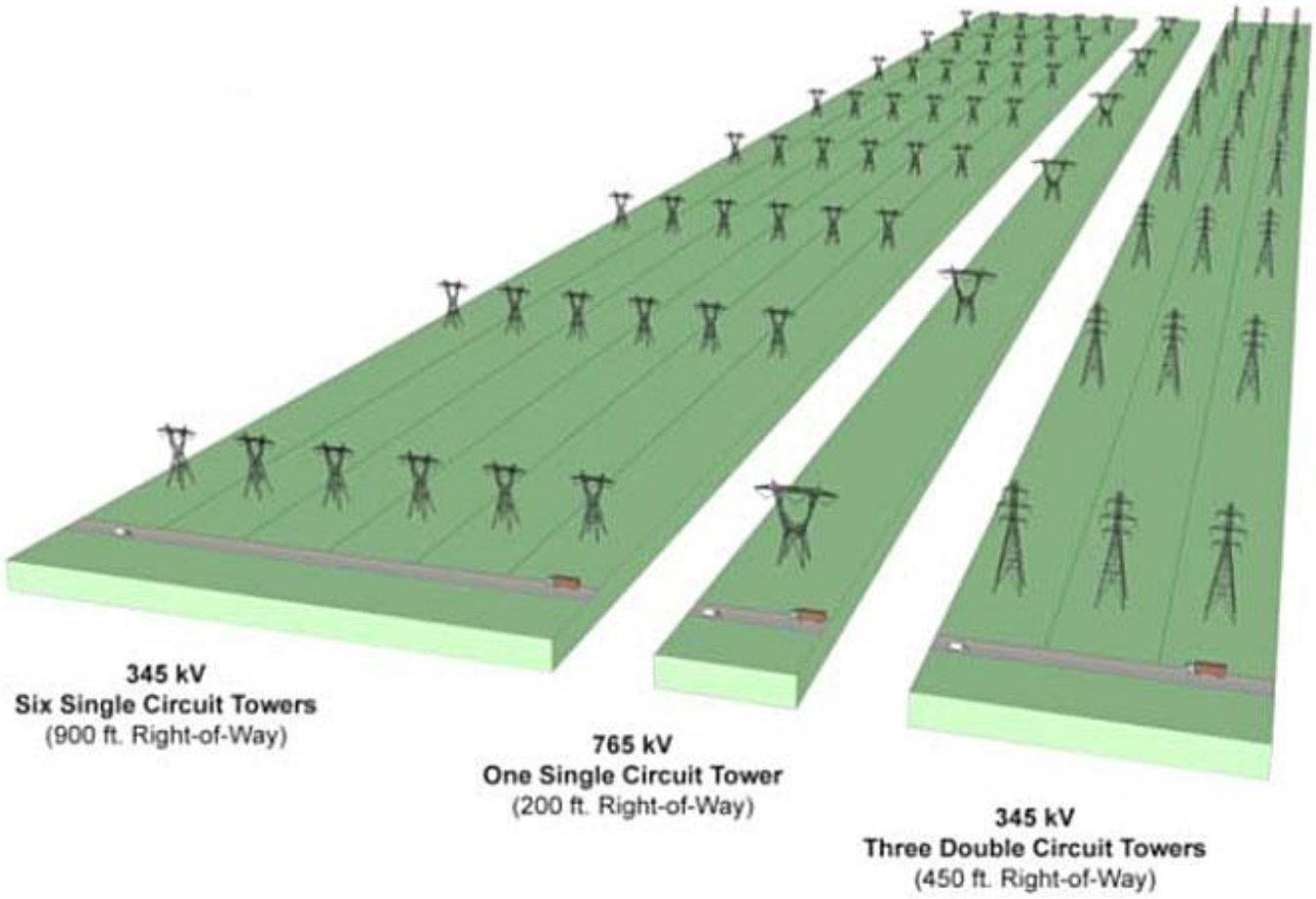
- The Brattle Group Study quantified NPV benefits of $1.5 billion over 40 years
- B/C Ratio of 0.7

Total	$$	B/C Ratio
APC	$819 M	0.41
Losses	$ 26 M	0.01
Wind Revenue*	$266 M	0.13
Fuel Diversity	$399 M	0.20
Reliability	$ -20 M	(0.01)
*(Adjusted down)	$1.5 B	0.74

Qualitative Benefits

Total (B/C at 20% of $$)	$$	B/C Ratio
Taxes (table 28):	$ 34 M	0.00
Econ. Trans (table 27)	$1,000 M	0.10
Wind Earning (table 5a)	$ 560 M	0.06
Econ Operating (table 5a)	$1,900 M	0.19
Wind Earning Construct (table 5a)	$ 766 M	0.08
Econ Construction (table 5a)	$2,300 M	0.23
Total	$6,500 B	0.66

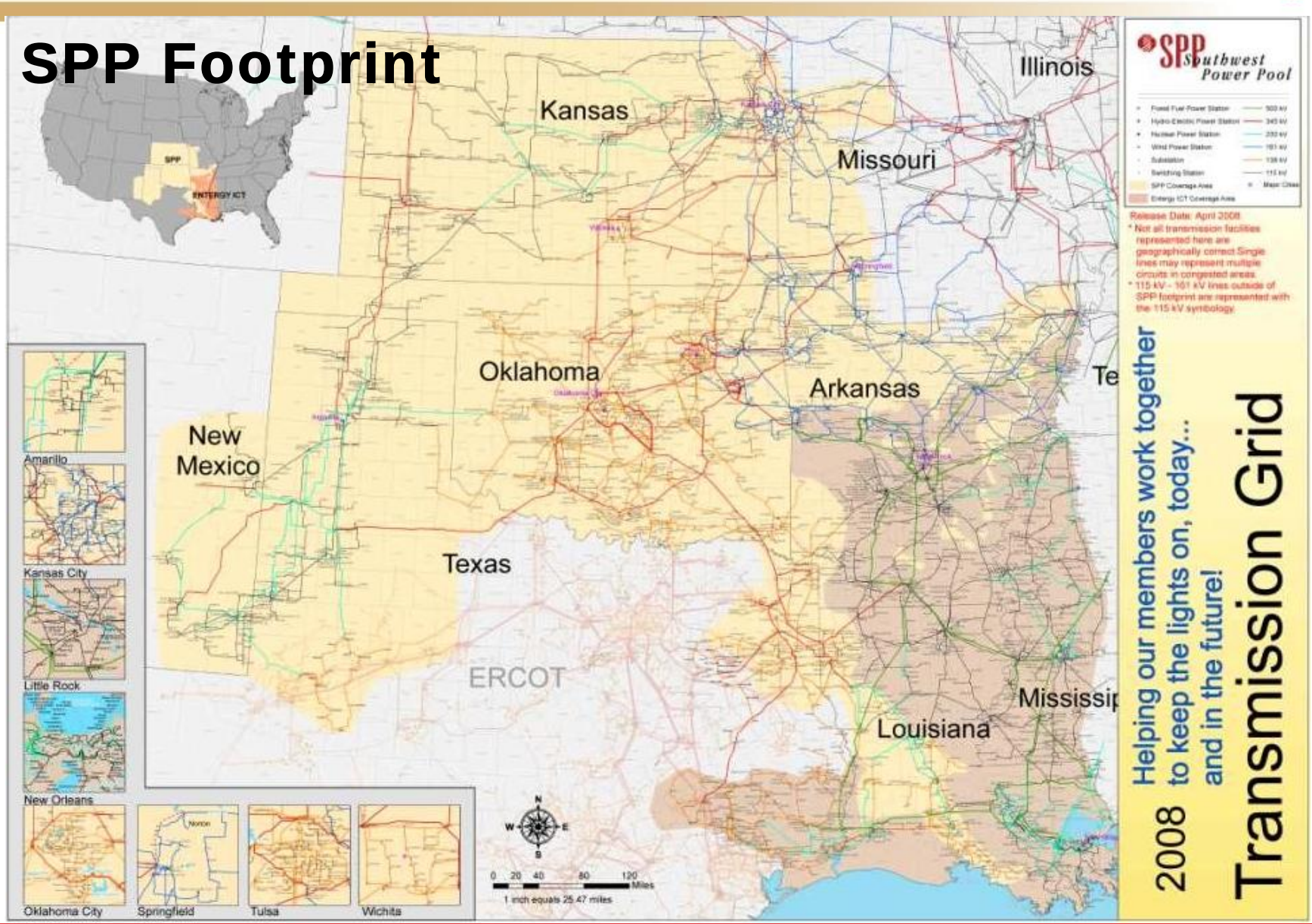
Larger Transmission Reduces Right of Way



Highway/Byway Cost Allocation

Voltage	Regional	Zonal
300 kV and above	100%	0%
100 kV - 299 kV	1/3	2/3
Below 100 kV	0%	100%

SPP Footprint



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